the chimpanzee the head is thickly clothed with hair, the face is flesh-colored, and the ears are smaller. Both these animals (which are in the London Zoological Garden) are carnivorous, catching and eating sparrows and pigeons. It is stated that this is never done by the chimpanzee. Dr. Sclater provisionally refers these animals to the *Anthropopithecus calvus* of Du Chaillu.

ZOOLOGICAL NEWS.—CŒLENTERATA.—Dr. H. V. Wilson records (*J. H. U. Circ.*, No. 70) that in *Cereactis bahamensis* the mouth occasionally grows together in the middle, leaving oval and anal openings at the ends. He also found a single larva of *Manicina areolata*, which exhibited the same peculiarity. In this connection reference is made to Sedgwick's celebrated paper on Metameric Segmentation.

In the same place Prof. J. P. McMurrich gives a list of the Actinaria of New Providence, enumerating fourteen species, of which *Cereactis bahamensis*, *Bunodes tæniatus*, *Aulactinia stelloides*, and *Gemmaria isolata* are new. The fact is also recorded that *Aulactinia stelloides* passes through an Edwardsia stage when eight nusenteries are present and the longitudinal muscles are arranged as in that genus.

ENTOMOLOGY.[1]

OBSERVATIONS ON ANTS, BEES, AND WASPS.[2]—Sir John Lubbock has published the eleventh part of his observations. He is of opinion that, though there may be nests of *Formica sanguinea* without slaves, an experiment which he has made seems to indicate that the slaves perform some important functions in the economy of the nest, though it is not yet determined what that function exactly is.

With regard to Ant-guests, he points out that Dr. Wasman has confirmed his observations, in opposition to Lespès, that, while ants are deadly enemies to those of other nests, even of the same species, the domestic animals may be transferred from one nest to another, and are not attacked. Attention is next drawn to Professor Emery's observations on mimicry among ants.

With regard to the color sense, Professor Graber has confirmed Sir John's observations on Ants and Daphnias, by

[1] This department is edited by Prof. J. H. Comstock, Cornell University, Ithaca, N. Y., to whom communications, books for notice, etc., should be sent.

[2] Journ. Linn. Soc. Lond., xx., (1888) pp. 118-36. 1889.

which he showed that they are sensitive to the ultra-violet rays, by similar observations on earth-worms, newts, etc. Light was found to act on decapitated earth-worms, though the differences were not so marked; the same held good for newts, when their eyes were covered over, and Graber hence concludes that the general surface of the skin is sensitive to light. Forel has made some observations on ants, the eyes of which were carefully covered by opaque varnish, so that they were rendered temporarily blind.

From experiments made with Platyarthrus, which have no eyes, the author found that they made their way into the shaded portion of a partly covered nest, and he remarks that it is "easy to imagine that in unpigmented animals, whose skins are more or less semitransparent, the light might act directly on the nervous system, even though it could not produce anything which could be called vision."

Sir John's experiments lead him to differ from M. Forel, who believes that bees have a certain sense of direction. The power of recognizing friends is discussed at some length, but the explanation of the fact still remains obscure. The most aged insect on record is a queen of *Formica fusca*, which lived for fifteen years; what is much more extraordinary is that she continued to lay fertile eggs; fertilization took place in 1874, at the latest, and there has been no male in the nest since then, so that the spermatozoa of 1874 must have retained their life and energy for thirteen years.

The seeds of *Melampyrum pratense* are, as Lündstrom has recently pointed out, closely similar to the pupæ of ants, and he has suggested that this may be an advantage to the plant by deceiving the ants, and thus inducing them to carry off and so disseminate the seeds. The author's own observations show that *Formica fusca* appears to take no notice of these seeds, but that, under certain circumstances, they are carried off by *Lasius niger*.

The observations of Mr. and Mrs. Peckham, on the special senses of Wasps, is referred to as containing conclusions which concur closely with those of Sir J. Lubbock.

A connected account of the author's observations is given in a recent work, "On the Senses, Instincts, and Intelligence of Animals, with Special Reference to Insects,"[1] which will be found useful as a handbook of the subject with which it deals. —*Jour. Royal Micr. Soc.*, 1889, p. 49.

BASAL SPOT ON PALPS OF BUTTERFLIES.[2]—Herr. E. Reuter states that in all the species of butterflies (between two

[1] 8vo, London 1888, 292 pp., 118 Figs.

[2] Zool. Anzeig. xi., (1888) pp. 500-3.

and three hundred) which he has examined there is at the base of the inner surface of the palps a naked spot which can be always easily seen. He consequently regards it as typical of the order.

It is generally well defined and ordinarily occupies the basal half of the first joint of the palp. The rings or furrows discovered by Landois are always present, though often indistinct or incomplete. When present, they ordinarily occupy the greater part of the basal spot, and are more or less parallel. They are best developed on the part of the surface which, in the natural position of the palps, is directed upwards and inwards; it is this part which is most commonly pressed against the basal part of the proboscis, which is provided with a raised ridge.

In addition to these rings there are peculiar forms of hairs which do not seem to have ever yet been described. They are conical in form, chitinous, are surrounded at their base by a circular membrane; they are all connected with nerve-fibers, on which, just before they enter the cone, a ganglionic swelling can be seen. There are several hundreds of these cones, and, in addition to them, there are immense numbers of similar, but much smaller, conical bodies. In the Microlepidoptera there are sometimes also pits or pores, and sometimes these are alone present.

There can be no doubt that we have here to do with specific sensory organs, but what is the special sense we do not know. The author is inclined to think that it is of an olfactory nature. The cones exhibit the greatest variability and highest grade of development in the Rhopalocera, and their variations may be of use in the definition of families and genera. In the Butterflies proper, the organ in question is always much larger and better developed in the male than in the female.—*Jour. Royal Micr. Soc.*, 1888, p. 943.

PARASITE OF COSMOPOLITAN INSECTS.—Under the title of "A Commencement of the Study of the Parasites of Cosmopolitan Insects,"[1] Mr. L. O. Howard gives a list of nearly 100 insects, common to the Old World and the New, together with a list of the European parasites of each, and a second list of the American parasites of each. This paper presents us with a large amount of information in a very compact space, and we hope it is only a forerunner of a more extended paper by the same careful author.

As illustrating the practical use that can be made of infor-

[1] Proc. of the Ent. Soc. of Washington, Vol. i., pp. 118-36.

mation of this kind, Mr. Howard gives the following interesting illustration:

"The Hessian Fly has been very destructive for two years past in England, and the question has been, and it is an important one, whence did it come? Two important wheat-growing districts furnish England with much of its grain, *viz.*, North America and Russia. Now it happens that within a few months of each other Dr. Riley monographed the North American parasites of this insect, and Dr. Lindemann the Russian parasites. No accurate way of fixing the source of the English supply was found, until Dr. Riley, on his recent trip to England, discovered that the parasites there were identical with the Russian forms, and, with one exception, specifically distinct from the American forms; the exception belonging to the Russian fauna as well as to the American. America is thus relieved from the onus, which falls on Russian shoulders."

THE EPIPASCHIINAE OF NORTH AMERICA.—Under this title the Rev. Geo. D. Hulst[1] monographs the American representations of that small group of moths of which Epipasachia is the typical genus. As to the zoological position of this group, he looks upon the Epipaschiinae as either connecting the Phycitidae with the Pyralidinae, or as the ancestral and now nearly obsolete stem from which, in different directions, the other two have arisen. He enumerates eleven genera, represented by nineteen species.

A STUDY OF THE CYNIPIDAE.—There is on our table a valuable paper on this subject, from the Agricultural College of Michigan, by C. P. Gillette. The paper is based on collections made in the vicinity of Lansing. Mr. Gillette makes many observations on the previously described species, and gives descriptions, with figures, of the galls of several new ones. A list of thirty-four species of Galls Flies, taken in this locality, and of the parasites bred from them, is appended to the paper.

COLEOPTEROUS LARVÆ AND THEIR RELATIONS TO ADULTS.—The present paper is the first of a series of investigations which it is my purpose to carry on in connection with the larvæ and their relations to adults. My studies are confined to the post ovarian stages, and in this discussion the term larvæ is used to indicate such conditions only. It is my purpose to inquire into the origin of larval forms, both ancestral and acquired, and to compare the results of the study of

[1] Entomologica Americana, Vol. v., pp. 41-52, 61-76.

the larvæ of the various groups of the animal kingdom with the results of the study of adults. The following questions are among those for which an answer is sought:

To what extent are larval forms representatives of ancestral stages in the history of animals, and to what extent are they adaptations on the part of the larvæ, and therefore secondary?

How far is it possible to assign reasons for the larval departures from ancestral type?

Has the larval departure from an ancestral type, where it has taken place, occurred in numerous individuals simultaneously, or have the variations appeared in one individual and then been transmitted from it to a long line of posterity.

Have the forms and habits of the adult any direct influence on the larvæ, or those of the larvæ on the adult?

Are larvæ reliable as a basis of classification.

Are larvæ of any value in teaching the past history of animals?

Are larvæ of any value in teaching relations?

In cases where larvæ are departures from the ancestral type, and therefore secondary, are they of any value in teaching past history or present classifications?

Are larvæ more or less variable than adults?

Are adaptive larval characters inherited by succeeding larvæ?

The present paper is the result of the study of the larvæ of beetles, this group being first selected as showing the greatest amount of variation within a single order. As a starting point a Campodeoid form is taken. This is the most widely distributed, and has frequently been pointed out as the closest representative of the ancestral insect living at the present day. Starting with the Campodeoid type the different families of beetles have been studied as far as is possible with our present knowledge of them. The following are the most important points presented by the study of this group.

1. With the exception of the Campodeoid type of larvæ, which is found in a number of families, all beetle larvæ are secondary modifications which have been introduced during the larval life of the beetles, and have never been represented by any adult features. They are, therefore, of no value in teaching the history of beetles except in their larval stages. They do not represent ancestral stages. They may, however, and frequently do, teach relationship, since the presence of a similar larva may indicate a recent common ancestor.

2. It is possible, amid the immense variety of larvæ, to rec-

ognize four somewhat distinct types: the Campodeoid type, a type slightly and variously modified from the Campodeoid type, a Scarabid type, and a maggot-like type, like that of the weevils. In many cases it is possible to determine definitely the sort of conditions that have produced the present type.

3. The division of larvæ into types seems to have no relation to the classification of adult insects into sub-orders. None of the classifications of adult beetles into sub-orders runs in any way parallel to the natural division of larvæ into groups. The classification of the families of larvæ does, however, run parallel to the classification of the families of adults, so that it is usually possible to tell from the structure of a larva to what family it belongs. To this rule there are many exceptions, some of which are easily explained by differences in habit. The exceptions are most common in the low, degraded types of larvæ. The classification of families into sub-families and genera seems also as a rule to run parallel with the classification of adults, though there are many exceptions to this rule. The exceptions are such as to indicate that in some cases the adult classifications are at fault, and in other cases that there is really no parallel between the two stages. From this we can draw the conclusion that the present larval types of beetles are about as old as families but not much older.

4. The amount of departure from the primitive larval type that any family of beetles presents, is no indication of the position in the scale of classification that the adults should occupy. At least this is true if we accept the classsification of adults recognized at present by our entomologists.

5. Family characteristics are usually well marked in the larvæ. Generic characteristics are also usually quite definite; specific differences are usually very small and do not seem to be very constant.

6. There is in most cases an evident relation between the habits of the larvæ of a family and those of the adults. This indicates that the habits acquired by one stage have subsequently had their effect on the habits of the other stage. It seems probable that in beetles the larvæ has been the first to modify its habits, and that the adult has subsequently acquired habits related to it. The larval stage seems thus to be more important than the adult; at all events it is more thoroughly protected, and is the first to be adapted to suit its surroundings.

7. The larvæ of beetles are much more diversified than their adults.

8. Although habits and the conditions that surround the larvæ have been very important features in the production of the present larval forms, some other force has been at work in producing, or rather in retaining them. For we find a great variety of larvæ at the present time with almost identical habits. This other force is undoubtedly heredity, which has frequently proved stronger than the modifying effect of the environment.

9. Beetle larvæ cannot be classified by the same characteristics used in classifying adults. The shape of the antennæ has no significance in the classification of larvæ, since it is almost uniform throughout the order. The shape of the legs, the number of tarsi, the shape of the coxal cavities, are of not much more value. The mouth parts seem to be of a little more value, and are of far less value in classification than they are in the adults.

10. The mouth parts of beetle larvæ, even in the typical Campodeoid form, are not Campodeoid in type, but approximate rather closely to those of the adult beetles. No traceable similarity can be found between the mouth parts of any particular family of larvæ and those of the adults of the same family, beyond the general similarity sometimes produced by like habits. It is true, however, that the mouth parts of all beetle larvæ are more like those of adult beetles than they are like those of any other order of insects. This is probably an example of what Hyatt and Cope call concentration of development, and which is elsewhere called precocious inheritance. It is an instance where the characters of the adult have been impressed on the larval stages.

11. In beetle larvæ we have quite a number of cases in which a similar larval type has been acquired independently in two or more families.

The above conclusions apply only to the group of Coleoptera, and while some of them will doubtless be found equally true of other orders of insects, some of them are probably peculiar to beetles.

This paper was discussed by Professors Hyatt, Putnam, and Fernald, and by Messrs. Sargent and Jackson.—*H. W. Conn, in Proceedings of Boston Society of Natural History*, Vol. xxiv., December, 1888.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

NATURAL SCIENCE ASSOCIATION OF STATEN ISLAND, Nov. 10, 1888.—This being the annual meeting, officers for the ensuing year were elected as follows: President, L. P. Grata-